ILNAS

Institut luxembourgeois de la normalisation
de l'accréditation, de la sécurité et qualité
des produits et services

ILNAS-EN 1998-2:2005/A1:2009

Eurocode 8: Design of structures for earthquake resistance - Part 2: Bridges

Eurocode 8: Auslegung von Bauwerken gegen Erdbeben - Teil 2: Brücken

Eurocode 8: Calcul des structures pour leur résistance aux séismes - Partie 2: Ponts

03/2009

National Foreword

This European Standard EN 1998-2:2005/A1:2009 was adopted as Luxembourgish Standard ILNAS-EN 1998-2:2005/A1:2009.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1998-2:2005/A1

March 2009

ICS 91.120.25; 93.040

English Version

Eurocode 8: Design of structures for earthquake resistance - Part 2: Bridges

Eurocode 8: Calcul des structures pour leur résistance aux séismes - Partie 2: Ponts

Eurocode 8: Auslegung von Bauwerken gegen Erdbeben - Teil 2: Brücken

This amendment A1 modifies the European Standard EN 1998-2:2005; it was approved by CEN on 12 February 2009.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Ref. No. EN 1998-2:2005/A1:2009: E

Foreword

This document (EN 1998-2:2005/A1:2009) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the secretariat of which is held by BSI.

This Amendment to the European Standard EN 1998-2:2005 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by March 2010.

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1) In **1.6.6 Further symbols used in Section 7 and Annexes J, JJ and K of EN 1998-2**

Add:

$d_{m,i}$ maximum total displacement of each isolator unit *i*

$d_{G,i}$ offset displacement of isolator *i*

2) In **7.5.2.4 Variability of properties of the isolator units**

Replace (5) and (6) by:

(5) The nominal design properties of simple low-damping elastomeric bearings in accordance with **7.5.2.3.3(5)** and **(6)**, may be assumed as follows:

– Shear modulus $G_b = \alpha\ G_g$

NOTE: The value of α typically ranges from 1,1 to 1,4. The appropriate value is best determined by testing of the device.

– where G_g is the value of the “apparent conventional shear modulus” in accordance with EN 1337-3:2005;

– Equivalent viscous damping $\xi_{eff} = 0{,}05$

(6) The variability of the design properties of simple low-damping elastomeric bearings, due to ageing and temperature, may be limited to the value of G_b and assumed as follows:

– LBDPs $G_{b,min} = G_b$

– UBDPs depend on the “minimum bearing temperature for seismic design” $T_{min,b}$ (see **J.1(2)**) as follows:

- when $T_{min,b} \geq 0^oC$

  $G_{b,max} = 1{,}2\ G_b$

- when $T_{min,b} < 0^oC$

  the value of $G_{b,max}$ should correspond to $T_{min,b}$.

NOTE: In the absence of relevant test results, the $G_{b,max}$ value for $T_{min,b} < 0^oC$ may be obtained from G_b adjusted regarding temperature and ageing in accordance with the λ_{max} values corresponding to K_p, specified in Tables JJ.1 and JJ.2.

3) In **7.5.4 Fundamental mode spectrum analysis**

Replace (3) by:

(3) This leads to the results shown in Table 7.1 and Figure 7.4.

Table 7.1: Spectral acceleration S_e and design displacement d_{cd}

T_{eff}	S_e	d_{cd}
$T_C \leq T_{eff} < T_D$	$2{,}5\ \dfrac{T_C}{T_{eff}}\ a_g S \eta_{eff}$	$\dfrac{T_{eff}}{T_C}\ d_C$
$T_D \leq T_{eff} \leq 4$ s	$2{,}5\dfrac{T_C T_D}{T_{eff}^2}\alpha_g S \eta_{eff}$	$\dfrac{T_D}{T_C}\ d_C$

where:

$$a_g = \gamma_I a_{g,R} \tag{7.7}$$

and

$$d_C = \frac{0{,}625}{\pi^2} a_g S \eta_{eff} T_C^2 \tag{7.8}$$

The value of η_{eff} should be taken from the expression

$$\eta_{eff} = \sqrt{\frac{0{,}10}{0{,}05 + \xi_{eff}}} \geq 0{,}40 \tag{7.9}$$

Maximum shear force

$$V_d = M_d S_e = K_{eff} d_{cd} \tag{7.10}$$

where:

S, T_C and T_D are parameters of the design spectrum depending on the ground type, in accordance with **7.4.1(1)**P and EN 1998-1:2004, **3.2.2.2**;

a_g is the design ground acceleration on type A ground corresponding to the importance category of the bridge;

γ_I is the importance factor of the bridge; and

$a_{g,R}$ is the reference design ground acceleration (corresponding to the reference return period).

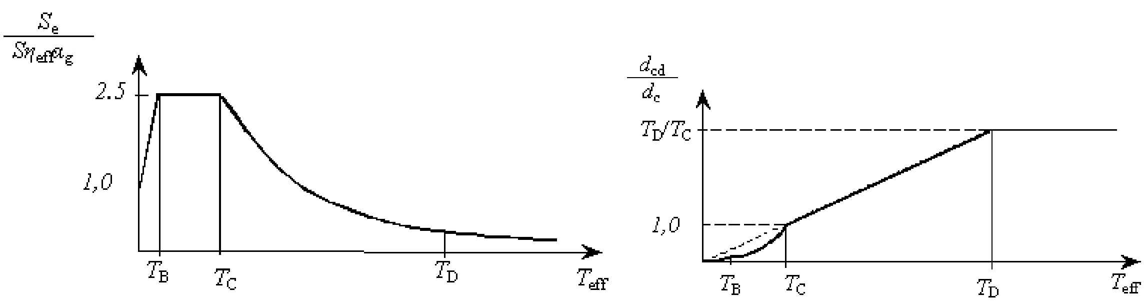

Figure 7.4: Acceleration and displacement spectra

NOTE 1: The elastic response spectrum in EN 1998-1:2004, 3.2.2.2(1)P applies up to periods of 4 s. For values of T_{eff} longer than 4 s the elastic displacement response spectrum in EN 1998-1:2004, Annex A may be used and the elastic acceleration response spectrum may be derived from the elastic displacement response spectrum by inverting expression (3.7) in EN 1998-1:2004. Nonetheless, isolated bridges with T_{eff} > 4 s deserve special attention, due to their inherently low stiffness against any horizontal action.